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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/729,422	12/05/2003	Panayiotis D. Papadimitriou	042933/302877	8394

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EXAMINER	
GHULAMALI, QUTBUDDIN	
ART UNIT	**PAPER NUMBER**
2611	

DATE MAILED: 07/18/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/729,422	PAPADIMITRIOU ET AL.	
	Examiner	Art Unit	
	Qutub Ghulamali	2611	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *22 March 2004*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-17* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-17* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☒ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *22 March 2004* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Specification

1. The abstract of the disclosure is objected to because of minor informality. In line 10, "prove" needs to be replaced with "provide". Correction is required. See MPEP § 608.01(b).

Claim Objections

2. Claims 1, 9 and 14, are objected to because of the following informalities:

The first use of abbreviation "STTD" in claims 1, 9 and 14, must be spelled out, for example, Space-time Transmit Diversity (STTD).

Similarly, claim 9, line 7, and claim 14, line 9, the first use of abbreviation "STTD-PIC" and "STTD-LMMSE" must be spelled out. For example, parallel interference cancellation (STTD-PIC) and Linear Minimum Mean Square Error (STTD-LMMSE) respectively.

Appropriate correction is required.

Claim Rejections - 35 USC § 103

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the

invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

4. Claims 1-17 are rejected under 35 U.S.C. 103(a) as being unpatentable over Karna (USP. 7,023,903) in view of Dunyak et al (US Pub. 2005/0002445) and Reznik (US Pub. 2003/0053526).

Regarding claim 1, Karna discloses a radio receiver for use in radio communication the receiver comprising:

a first stage (preceding the n parallel interference cancellation stages) comprising an Space-time Transmit Diversity (STTD-RAKE) receiver (multi-user combination signals with various spreading codes in spread spectrum processing signals in real time comprising one or more antennas, the correlator and regeneration process the samples simultaneously) (col. 3, lines 11-23; col. 5, lines 59-67; col. 6, line 1; col. 4, lines 6-30; col. 6, lines 63-67; col. 14, lines 13-21) for receiving and processing the transmitted signal and for producing an estimation of the transmitted signal as an output (abstract; col. 3, lines 12-23; col. 7, lines 1-4);

a second stage (fig. 6, elements 602A to 602N) for receiving the output of the first stage and processing it to further refine the estimation using parallel interference cancellation (STTD-PIC) (col. 10, lines 41-51); and

a third stage for receiving the output of the second stage and processing it to further refine the estimation using STTD-PIC (col. 10, lines 51-61). Karna however, does not explicitly disclose at least one of the second stage and the third stage comprises an STTD-linear minimum mean square error (LMMSE) receiver. Dunyak as well as Reznik in a similar field of endeavor discloses, use of LMMSE in parallel interference

cancellation (PIC) receiver (Dunyak page 1 sections 0012, 0049; Reznik page 1, sections 0011, 0014, 0040, 0044). It would have been obvious to a person of ordinary skill in the art at the time the invention was made to utilize least mean square error correction as taught by Dunyak and Reznik in the system on Karna because use of linear mean square error correction can provide multi-user error correction with reduced complexity and enhanced economic benefits.

As per claim 2, Dunyak discloses receiver is operable to CDMA standard (page 1, section 0011; page 2, section 0036).

As to claim 3, Karma and Dunyak/Reznik combination discloses second stage comprise an STTD-LMMSE receiver (Dunyak page 1 sections 0012, 0049; Reznik page 1, sections 0011, 0014, 0040, 0044).

Regarding claim 4, Karma and Dunyak/Reznik combination discloses third stage comprise an STTD-LMMSE receiver (Dunyak page 1 sections 0012, 0049; Reznik page 1, sections 0011, 0014, 0040, 0044).

Regarding claim 5, Karna discloses each stage comprising an STTD-PIC further can comprise an LMMSE receiver as disclosed by the Dunyak/Reznik arts.

As to claim 6, Karna discloses multi stages 602A to 602N include third stage for receiving (col. 3, lines 11-23; col. 10, lines 46-50).

Regarding claim 7, Karna discloses receiver also receives a pilot signal to produce a refined estimation of the pilot signal (col. 1, lines 48-63).

Regarding claim 8, Karna discloses a plurality of stages that are subsequent to the first stage also each receive a pilot signal and produce a further refined (col. 3, lines 28-49).

Regarding claim 9, Karna discloses a system for wireless communication using STTD comprising:

a transmitter operable for transmitting signals using STTD (space time diversity) (col. 4, lines 56-67; col. 5, lines 8-25, 59-67);

a receiver for receiving the transmitted signals, wherein the receiver comprises:

a first stage (preceding the n parallel interference cancellation stages) comprising a STTD-RAKE for processing the received signal to produce an output (multi-user combination signals with various spreading codes in spread spectrum processing signals in real time, the correlator and regeneration process the samples simultaneously) (col. 3, lines 11-23; col. 4, lines 6-30; col. 6, lines 63-67). Karna even though discloses a second stage receiving the output of the first stage and processing it to produce an output (fig. 6, elements 602A to 602N) comprising an STTD-PIC (col. 10, lines 41-51), however does not explicitly disclose the second stage as STTD-LMMSE. Dunyak as well as Reznik in a similar field of endeavor disclose, use of LMMSE in parallel interference cancellation (PIC) stages (Dunyak page 1 sections 0012, 0049; Reznik page 1, sections 0011, 0014, 0040, 0044). It would have been obvious to a person of ordinary skill in the art at the time the invention was made to utilize least mean square error process as taught by Dunyak and Reznik in the system on Karna

because use of linear mean square error process can provide multi-user error correction with reduced complexity and enhanced economic benefits.

As per claim 10, Karna discloses one or more (n multiple PIC stages) that includes a third stage for receiving the output of the second stage and further processing it (col. 3, lines 14-23)

Regarding claim 11, Karna even though discloses one or more stages including a third stage do not explicitly disclose it as a LMMSE. Dunyak and Reznik in a similar field of endeavor discloses, use of LMMSE in parallel interference cancellation (PIC) stages (Dunyak page 1 sections 0012, 0049; Reznik page 1, sections 0011, 0014, 0040, 0044; page 4, section 0049). It would have been obvious to a person of ordinary skill in the art at the time the invention was made to utilize least minimum mean square error process as taught by Dunyak and Reznik in the system on Karna because use of linear minimum mean square error process can result in an algorithm with excellent performance even in the presence of high levels of multi-access interference with multi-user error correction with reduced complexity.

As per claim 12, Karna discloses the second stage also receives the transmitted signals (col. 8, lines 41-55; col. 10, lines 41-46).

Regarding claim 13, Karna, discloses system employs 2-1, diversity (one or more antennas) (col. 2, lines 47-55).

Regarding claim 14, Karna discloses a method for processing a received STTD radio signal comprising:

receiving indications (receiver uses to identify) of the received radio signal in a first stage RAKE-STTD (col. 5, lines 10-23; col. 3, lines 11-23; col. 6, lines 63-67);

processing the signal in the first stage to produce an estimate of the data as output (col. 3, lines 14-23; col. 4, lines 6-30; col. 6, lines 63-67);

receiving as input in a second stage of the receiver (fig. 6, elements 602A to 602N) the output of the first stage (col. 10, lines 41-51); and

processing the input received in the second stage to produce a refined estimate of the data as output (col. 10, lines 41-61). Karna even though discloses a second stage receiving the output of the first stage and processing it to produce an output (fig. 6, elements 602A to 602N) comprising an STTD-PIC (col. 10, lines 41-51), however does not explicitly disclose the second stage comprise an STTD-PIC and STTD-LMMSE. Dunyak as well as Reznik in a similar field of endeavor disclose, use of LMMSE in parallel interference cancellation (PIC) stages (Dunyak page 1 sections 0012, 0049; Reznik page 1, sections 0011, 0014, 0040, 0044). It would have been obvious to a person of ordinary skill in the art at the time the invention was made to utilize least mean square error process as taught by Dunyak and Reznik in the system on Karna because use of linear mean square error process can provide multi-user error correction with reduced complexity and enhanced economic benefits.

As per claim 15, Karna discloses n multiple stages (fig. 6, elements 602A to 602N) receiving as input from each of the stages in succession (first to second to third and so on) to refine estimates from each stage into the next (col. 6, lines 41-61; col. 7, lines 1-25).

As to claims 16 and 17 Karna discloses second and the third stages receive signals for processing (interference cancellation) (col. 10, lines 41-61; col. 6, lines 41-61; col. 7, lines 1-25).

Conclusion

5. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

US Patents:

US Patent 6,570,864 to Kim et al.

US Patent 6,6,975,666 to Affes et al.

US Pub. 2004/0120299 to Kidiyarova-Shevchenko et al.

Publications:

Rezaaifar et al., "Multi-Stage Detection Scheme for CDMA System," IEEE 1997, pp 474-477.

Mahesh et al., "Multistage Detection in Asynchronous Code-Division Multiple-Access Communication," IEEE Transaction on Comm., 1990, pp 509-519.

Xue, Guoqiang et al., "Adaptive Multistage Parallel Interference Cancellation for CDMA," IEEE Journal on Selected Areas in Communications, vol. 17, No. 10, pp. 1251-1255, Oct. 1999.

6. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Qutub Ghulamali whose telephone number is (571) 272-3014. The examiner can normally be reached on Monday-Friday, 7:00AM - 4:30PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Mohammad Ghayour can be reached on (571) 272-3021. The fax phone number for the organization where this application or proceeding is assigned is (571) 273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

QG.
Examiner,
AU-2611.
June 29, 2006.

MOHAMMED GHAYOUR
SUPERVISORY PATENT EXAMINER